JONES DAY

51 LOUISIANA AVENUE, N.W. • WASHINGTON, D.C. 20001.2113

TELEPHONE: +1.202.879.3939 • FACSIMILE: +1.202.626.1700

DIRECT NUMBER: (202) 879-3630
BOLCOTT@JONESDAY.COM

October 11, 2019

VIA ELECTRONIC FILING

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: Written *Ex Parte* Notice
ET Docket No. 18-295
GN Docket No. 17-183

Dear Ms. Dortch:

On September 13, 2019, representatives of The Boeing Company ("Boeing") met with Commission staff to discuss the technical justifications for permitting the use on aircraft of unlicensed access points and client devices operating in the 6 GHz band. During the meeting, the staff asked Boeing to estimate the aggregate signal energy that may result from unlicensed devices operating on aircraft in the 6 GHz band toward satellites in geostationary ("GSO") orbit.[1]

Boeing's analysis indicates that the aggregate emissions from 6 GHz unlicensed devices on aircraft is unlikely to exceed -186.72 dBW/1 MHz toward GSO satellites. In reaching this conclusion, Boeing employed FAA data indicating there are approximately 5400 aircraft in flight over the continental United States during periods of peak operation.[2] This total invariably includes air freight and general aviation aircraft that usually do not operate wireless access points onboard. Further, as many as half of these flights are traveling in a North/South direction, making it highly unlikely that emissions emanating from the sides and windows of those aircraft would radiate toward the GSO arc. Therefore, a conservative total of 2817 aircraft was used in this analysis, which were assumed to be evenly distributed across the United States.

[1] Boeing is studying the issue of the aggregate signal energy resulting from unlicensed devices operating on aircraft in the 6 GHz band toward fixed receivers on the ground, which Boeing may address in a subsequent filing.

[2] *See* Air Traffic By The Numbers, Federal Aviation Administration, at 9 (June 2019), *available at* https://www.faa.gov/air_traffic/by_the_numbers/media/Air_Traffic_by_the_Numbers_2019.pdf (*last visited* Sept. 30, 2019).

In preparing this analysis, the emissions from two types of transmitters must be considered, wireless access points and client devices. With respect to access points, modern commercial aircraft have at least one wireless access point in each passenger section of the cabin, along with at least one access point for crew communications. Consistent with this, the Boeing 777 includes up to ten wireless access point, the 787 includes up to eight access points, and the 737 includes up to four access points. Although the commercial aviation industry employs a mix of larger and smaller aircraft in the United States, most such aircraft are in the size range of a 737 or smaller.[3] In order to address this size range, this analysis assumes that each aircraft has an average of four unlicensed wireless access points in operation, which is arguably far more than what exists in actual operation.

As Boeing indicated in its *ex parte* notice dated September 17, 2019, unlicensed access points are routinely mounted at the crest of the aircraft cabin and radiate down toward the passenger seats. The transmission path from the access points toward the passenger windows are obstructed by overhead baggage compartments. Therefore, in assessing the aggregate emissions toward the GSO arc, consideration was given only to emissions from client devices maintained by passengers and crew and not the ceiling-mounted access points.

Although each aircraft may include a large number of client devices, only one client device can operate with each access point on any single frequency channel at the same time. Therefore, assuming that an aircraft is equipped with four access points, only four client devices can be transmitting simultaneously on any single channel within the aircraft. In actual operation, however, the wireless data flow is highly asymmetrical (most passengers watch programming rather than generate data) and each wireless channel is used for uplink transmissions from client devices only about 20 percent of the time. Nevertheless, it remains possible (albeit unlikely) that all the access points on an aircraft could be receiving client device transmissions using a particular frequency channel at the same instance. Therefore, this analysis conservatively assumes the simultaneous transmissions from four client devices on each channel from within each aircraft.

For purposes of the analysis, it was further assumed that each client device will operate at a transmit power level of -28 dBW/1 MHz, which is consistent with normal power levels used on aircraft today. Boeing also conservatively assumed that no signal attenuation would result from the aircraft fuselage or windows, even though attenuation of 25 dB has been demonstrated in testing. Based on these highly conservative assumptions, it was concluded that the aggregate signal energy toward the GSO arc in those portions of the 6 GHz band that are used for client uplink transmissions will be -186.72 dBW/1 MHz.

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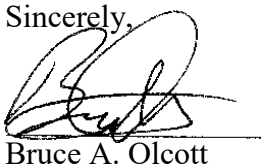
[3] This is based on FAA statistics indicating there are approximately 44,000 flights in the United States each day carrying a total of 2,789,971 passengers, averaging about 63 passengers per flight. *See* https://www.faa.gov/air_traffic/by_the_numbers/ (*last visited* Sept. 30, 2019).

Finally, in considering this data, the Commission should not combine the aggregate emissions from aircraft with the anticipated aggregate emissions from client devices on the ground in order to calculate the total potential impact on GSO satellites. This is because all unlicensed client devices on aircraft are invariably drawn from the population of unlicensed client devices maintained by consumers. Put another way, each time a passenger carries an unlicensed client device onto an aircraft, it reduces by one the number of unlicensed client devices that may be in use on the ground.

Thank you for your attention to this matter. Please contact the undersigned if you have any questions.

Sincerely,



Bruce A. Olcott
Counsel to The Boeing Company